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Distribution of Burden

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Editorial Department Note

Membership in our association is not limited only to those technically trained in the field of cost accounting. Our membership is much broader than the name might seem to indicate. A sizeable portion of the members belong rather to the executive group which is interested in using the results of cost accounting than in the technique and procedures involved. There is also a younger element of the membership not so thoroughly grounded in the principles of cost accounting nor in its practice. Accordingly, it is quite appropriate to provide occasionally through the medium of the Official Publications a restatement of some of the basic principles on which cost accounting rests and to indicate something of its technique. The author of this number does not address himself to the "war horses" of the profession, but rather to the younger group referred to above.

Grant L. Bell was graduated from the business college of Wyoming Seminary at Kingston, Pa., in the year 1895. His earliest business experience was with his father who was a general contractor and builder. He was then employed by the Traders National Bank of Scranton, Pa., filling successively all of the different positions from messenger boy to assistant cashier. From there he went to the Title Guaranty and Trust Company, Scranton, Pa., which later became the Title Guaranty and Surety Company. He was treasurer and comptroller of this company for about fifteen years, having supervision of the auditing and accounting departments of the home office as well as about fifteen branch offices throughout the United States and general agencies in every state in the Union with one or two exceptions.

During the term of his banking connections he also did considerable public accounting work. His public accounting experience covers a period of about twenty-five years, devoted to general practice, appraisal, and tax work.

Mr. Bell is a member of the American Institute of Accountants, Fellow in the Central Association of Accountants of London, England, Certified Public Accountant of the State of New Hampshire, and a member of the American Society of Certified Public Accountants. He is a past president of the Scranton Chapter of the National Association of Cost Accountants, and a newly elected member of the National Board of Directors.

DISTRIBUTION OF BURDEN

As a matter of explanation, it should be stated that the term, burden, as used here, will be understood to mean overhead or manufacturing expense. As all experienced cost accountants agree, it is the puzzle of the cost finder. It is the great cause of the difficulties, the inaccuracies, and most of the divergencies in both the theory and practice of cost finding. Yet, while it is frequently a "puzzle," it is nevertheless an important part of all manufacturing costs, sometimes by far the greater part, although it is often, in a greater or less degree, an intangible part, showing in results but not fully seen.

Burden is the third of the three elements of production costs,

and is unquestionably the most difficult to determine accurately; and when its determination is completed, the end in view is but half attained, for the overhead as determined must still be applied to the manufactured product, so that it will when added to the charges for material and labor disclose the true cost of production. For the benefit of our younger members present who may not be experienced in cost work, it might be well at this point to depart from the subject of burden and spend a few minutes on the first two elements of cost, namely, material and labor.

Material

The storing and recording of raw materials and finished product is one of the first and most important features pertaining to the success of the cost system, the effectiveness of the stock record depending very largely upon actual storeroom accommodations, the accuracy of production costs depending to a large extent on the method of handling stores and on the accuracy of the stores record.

All materials should be controlled by stores, that is, all materials purchased should be charged into a stores account. The stores account may be divided into as many divisions as the business may require, such, e.g., as raw stores, semi-finished stores, finished stores, etc.

The means of withdrawing materials from the stores is by requisition, a requisition being required for each lot of materials taken from the stores for manufacturing purposes. The requisition bears the order number on which the material is to be applied, and comes to the cost clerk properly filled out, showing the kind and quantity of materials used. Material requisitions are divided into two classes, namely: Direct and Indirect.

Direct material is material withdrawn from stores that can be charged direct to some particular job or order.

Indirect material consists of supplies and materials which are necessary in the production of the product but which cannot be applied to any particular order. That is, they apply to all orders passing through the process of manufacture.

It is the practice of some manufacturing plants to charge indirect material direct to manufacturing expense as purchased, but such practice should be discouraged, as indirect material is a large factor in all plants and should be controlled in the same manner as the direct materials.

The control of indirect materials is brought about by a special series of order numbers, known as factory expense numbers, to which all such materials are charged during the month and the aggregate total of these items is added to manufacturing expense or overhead for distribution to cost of production.

Due to the inaccuracy of requisitioning materials from stores there is frequently found to be a large shrinkage in materials in stores. This matter has been the subject of debate many times in

the past, as to whether or not reserves should be created to cover the shrinkage. In my opinion such reserves tend to create a carelessness among the employees for the reason that the practice of making monthly adjustments to these reserves becomes known and the clerks become less cautious in the performance of their duties. There is a way to overcome this shrinkage in materials which I believe is far superior to the method of setting up reserves. It is the method of periodical tests. In other words, we should guard the materials in stores as carefully as we do the cash in the bank, and we would not think of setting up reserves for shortages in cash.

By the method of periodical tests, adjustments can be made from time to time through the burden account as discrepancies occur in the stores, and in this way the cost department is on notice at all times as to where the shrinkage occurs, whereby in setting up reserves the cause of the shrinkage cannot be obtained.

Procedure in Handling Material Reports

A brief outline of the procedure in handling material reports will now be given.

a. Requisitions should be numbered with a definite series of numbers so that the cost division will know whether or not all requisitions are being received from the factory.

b. Requisitions should be thoroughly examined when received from the factory office to see that they are properly numbered and dated and that they contain a proper description of the material to which they relate.

c. Requisitions should then be priced from the stock records, calculated, and approved for entry to stock and cost records.

d. Entry is then made to the various cost records as follows:

Direct material, under the order method of cost finding, to the definite cost records of each job or order; under the process method of cost finding, to the particular cost record of the definite process or article affected.

Indirect Material to the department and expense account shown on the requisition.

e. Total amount of direct material requisitions for the month is a debit of work in process account and a credit to stores account; and in the case of indirect materials, a credit to stores and a debit to manufacturing expense.

Labor, the Second Element of Production Cost

There are many ways and methods for controlling factory labor, and where the manufacturing plant is large enough to warrant the expense, there is no better method than the tabulating machine method. However, as many of the plants have not adopted this method, I will give you a brief outline of a system of time-keeping which is very quick, elastic and accurate.

The method which I would recommend for a plant of any capacity, in the absence of accounting machines, comprises a

coupon time ticket, consisting of a pay check and four coupons. This time ticket is perforated between the coupons for cutting and sorting. Each employee is given one of these cards on which he is required to note daily the nature of work done and the time required to complete the work, marking the operations and any other information which the cost division may require.

As these coupons are rated and extended, the aggregate total of all coupons will equal the time and amount shown on the pay check.

The method of distribution is then similar to the tabulating machine method. The pay checks are filed by man number until the end of the pay period, when they are added by machine for payroll purposes, and the coupons which were separated from the pay check are filed according to order number until the completion of the order when they are totaled and charged direct to the order. At the end of each month all coupons in files should be totaled and posted to the cost sheets to prove the total labor charge for the month.

Work in Process Account

For control of the material and labor charged to shop or factory order, an account known as work in process is opened to which are debited all charges made to shop and factory orders. The work in process account acts as a control on material and labor charges into production, in much the same way as the accounts receivable and accounts payable accounts control the subsidiary customers' and creditors' ledgers in general accounting.

Factory Order

An important element in the success of a cost system is the method of issuing factory orders. The nature of the factory order will depend entirely upon the kind of product manufactured and the method of plant production. In any case, however, factory orders should be divided into two classes, namely: productive and non-productive. Productive orders cover product manufactured for stock or sale and should in all cases be controlled by the requirements of the sales orders and the maximum and minimum quantity to be carried in the plant stores. Non-productive orders cover construction, installation of equipment, manufacture of tools, etc. Separate orders should be issued for each and every lot or job started in the factory, whether for manufacture of product or construction work. Manufacturing orders should clearly state the description of the work to be done, and copies of all factory orders should be sent to the cost department from which a cost sheet will be made for control of the cost of producing the product called for on the order.

Standing Orders. In every factory there are certain quantities of materials and labor consumed which cannot be applied against any particular manufacturing or plant order, as for instance—oil, waste, cleaning, foremen, truckmen, packers, etc. In pre-

paring the classification of accounts, special account numbers should be provided into which all material and labor of this character will be charged. No orders need be issued from time to time for this class of material and labor, standing order numbers taking the place of factory orders, but special bulletins should be located throughout the plant where access can be readily made to same by the foremen and workmen in the plant, showing the standing order numbers and description of accounts.

Route Order. In connection with the factory order, route orders should be made and forwarded to the plant superintendent to follow the parts to be manufactured from the raw stores through the plant to the finished stores. This route order will give full detail as to the product called for on the manufacturing order and is the medium through which the factory employee gets his information as to order number, etc., for marking time cards.

Cost Sheet

The cost sheet is merely a form of ledger for posting the details of the work in process account. Cost sheets are made for each factory order, and to these cost sheets are charged all materials and labor consumed on these orders, the cost sheet bearing the same order number as the shop order. Information as to material and labor costs are furnished by material requisitions and time tickets as previously explained.

Burden

Having discussed the first two elements of Cost, let us return again to the third element, burden.

This element is divisible into at least three distinct parts, which are as follows:

a. Indirect material.
b. Indirect labor.
c. Fixed and miscellaneous charges.

These will be taken up in turn.

Indirect Material. Under this classification are included all items of miscellaneous materials that are necessary in production of manufactured goods but which, in themselves, do not appear in the product itself.

Indirect Labor. Under this heading must be classified all expenses in factory and factory offices for labor that is not expended directly on goods in process of manufacture and which cannot definitely be allocated as part of the cost of some particular piece or unit.

Fixed and Miscellaneous Charges. The third division of burden element of cost consists of those unavoidable expenses generally known as fixed charges. These include such items as depletion, amortization, rent, depreciation, taxes, insurance, and such other miscellaneous charges of a similar nature as cannot con-

sistently be classified as either direct or indirect materials or direct or indirect labor.

In order to obtain departmental costs which will facilitate a more equitable distribution of overhead expenses to manufacturing orders, it is first necessary to determine the proper division of the plant into productive and non-productive departments. By productive departments I mean departments through which parts pass in the process of manufacture; the non-productive departments being those departments which affect the process of manufacture as a whole but not on any particular unit thereof.

The next step after determining the proper departments is to provide a quick and accurate method of distributing the overhead expenses to these departments. For this purpose I find the following plan satisfactory as being quick and accurate:

a. Classify the expense accounts as to administrative and manufacturing.

b. Use an accounts payable register for entering all invoices received, of whatever nature, and for the distribution of the same. This register should be designed as follows:

Section 1—Accounts Payable Record.
Section 2—General Ledger Accounts.
Section 3—Stores Account.
Section 4—Payroll.
Section 5—Administrative Expenses.
Section 6—Manufacturing Expenses.

These sections should be subdivided as follows:

Section 1—*Accounts Payable Record,* Form 1, page 859, controls the entries to Sections 2 to 6, inclusive, this record being so designed as to contain a columnar section for each of Sections 2 to 6, inclusive. The total of each section in the Accounts Payable Record will agree with the aggregate total of the different accounts in its respective section if postings have been made correctly. Any discrepancies can be easily located by this method for the reason that the sections are controlled and will show in which section the errors are.

Section 2—*General Ledger Accounts*—to contain a recapitulation sheet, Form 2, page 859, for each asset or expense account not provided for in stores or manufacturing accounts.

Section 3—*Stores Accounts*—to contain a recapitulation sheet, Form 2, for each store account as per classification in the chart of accounts.

Section 4—*Payroll*—only one recapitulation sheet required, Form 2.

Section 5—*Administrative Expenses*—to contain a recapitulation sheet, Form 2, for each expense account as per classification of administrative and selling expenses in the chart of accounts.

Section 6—*Manufacturing Expenses*—to contain an Expense Distribution sheet, Form No. 3, for each manufacturing expense

account as per classification of manufacturing expense in the chart of accounts.

Each section should have index sheets bearing the account number—a separate index sheet for each account. As invoices are received and entered in the Accounts Payable Register, Form 1, entry will also be made to its proper section and account at the same time, thereby completing the distribution of each invoice as received.

The distribution of manufacturing expense will be handled in the following manner:

a. Classify the expense accounts in the expense distribution section in accord with the classification in chart of accounts, providing a tabbed index for subdivision of accounts.

b. Expense distribution sheet, Form 3, page 860, is designed to provide a column for each division.

c. Expense bills as received by cost division will be entered in accounts payable register as a debit to manufacturing expense and credit to accounts payable, showing account number to be charged. As bills are entered in the accounts payable register the same will be posted immediately to expense distribution sheets, distributing same as to division applicable.

d. At the close of the month the expense distribution ledger will be balanced with the manufacturing expense column in the accounts payable register, after which the non-productive divisions will be pro-rated over the productive divisions and the final total of the productive divisions pro-rated over cost of work in process.

e. To assemble the expense distribution by division, use Form No. 4, page 860, "Synopsis of Operations," which requires a set of these sheets for each division, with the expense items listed in chronological order according to number.

Method of Overhead or Burden Application

Assuming that the departmental method of distributing overhead just outlined is adopted, there still remains the complex problem of application. This is a problem of determining upon what basis the overhead shall be distributed within the departments so that each job, order, or article may be charged with the portion that properly belongs to it.

In order to establish a basis of distribution several questions regarding the conditions of production in the plant must first be answered. These are:

a. Shall the basis for the distribution be the cost of the labor expended upon the work, or the time given to it in the department?

b. Does the cost of material enter into it as a factor?

c. Is a machine rate possible or practical?

It is thus seen that no one method of distributing indirect expense can be applicable to all cases, everything depending on the particular conditions of the plant.

Time would not permit me to attempt to describe in detail

Section, 1.
Form, 1.

Accounts Payable Register

Page ____

Month Of ____ 19__.

Statement	Date	Accounts Payable			Record of Payment			Creditors Name	General Ledger			Stores		Adm. Exp.		Mfg. Exp.		Pay-Roll.		Statement
		Allowance Debit	Invoice Number	Amount Credit	Date Paid	Check Number	Unpaid Balance Prior Month		Acct No	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	
								Brought Forward												

Sections, 2-3-4-5.
Form, 2.

Recapitulation Sheet

Account No ____
Account ____

	Month ____			Month ____			Month ____			Month ____			Month ____			Month ____		
	Day	Folio	Amount	Day	Folio	Amount	Day	Folio	Amount	Day	Folio	Amount	Day	Folio	Amount	Day	Folio	Amount

Account No ____

Manufacturing Expense Distribution Sheet

Section, 6.

Account No. ——

Manufacturing Expense, Distribution Sheet.

Section, 6.
Form, 8.

Account _____ Month of _____ 192__

Productive Departments															Reference						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Date	Folio	Amount				

Section 6
Form 8

Account No. ____

Account _____

Non - Productive Departments.																					
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	

Folio. _____

Department. _____

Synopsis Of Operations

Account	A/c No.	January			February			March			April			May			June		
		Current Month	This Year To Date	Last Year To Date	Current Month	This Year To Date	Last Year To Date	Current Month	This Year To Date	Last Year To Date	Current Month	This Year To Date	Last Year To Date	Current Month	This Year To Date	Last Year To Date	Current Month	This Year To Date	Last Year To Date

every method that may be employed, therefore I will devote the time to those which are commonly used at the present time and which, as more or less standard methods, may be satisfactorily applied under definite conditions of manufacture. These are:

a. Prime Cost Method.
b. Productive Labor Cost Method.
c. Productive Labor Hours Method.
d. Machine Rate Method.

Prime Cost Method. Of all methods, the Prime Cost Method is considered the most simple. By this method, in order to obtain the proper percentage to be used, it is necessary only to take the total overhead expense and divide it by the total material and labor, the result being the percentage rate to be used.

For example, if during a definite period the amount expended for all direct material is $10,000 and for direct labor $20,000, the overhead expenses for the same period being $20,000, the percentage to be used in distributing overhead costs over the production would be ascertained as follows: Overhead cost, $20,000 divided by material cost, $10,000 plus labor cost, $20,000 equals 66 2/3%, the rate to be applied to the prime cost to cover the overhead cost on the article.

The only advantage of this method is its simplicity. The chief disadvantage is that in almost all cases some of the articles manufactured are burdened with too much overhead while others are not burdened with sufficient; all articles manufactured do not require the same operations, and accordingly some must bear a percentage of the overhead properly belonging to departments through which they do not pass.

Productive Labor Cost Method. The Productive Labor Cost Method is based upon the principle that indirect expenses are incurred in proportion to the cost of the labor involved.

To arrive at the proper percentage to be used, it is necessary only to divide the total amount of overhead expense for the period by the total cost of the direct labor for the period, the result showing the proportion of overhead expenses to the total productive labor in terms of percentage. The amount to be applied is then found by multiplying the direct labor cost by the percentage, the result to be added to the material and labor costs to obtain the total factory cost.

This method is simple and very widely used, and will oftentimes prove satisfactory under the following conditions:

a. The labor should be the dominant element in the manufacturing process.

b. There should be a marked uniformity as to product, wages paid and time of operation on the article manufactured.

These conditions rarely exist throughout an entire factory, but if each department's overhead is distributed separately the method will prove to be quite accurate.

Productive Labor Hours Method. The principle of the Pro-

ductive Labor Hours Method differs from the Productive Labor Cost Method only in that the amount of labor is measured by time and not by cost. That is to say, the overhead expenses of a plant are considered to be in proportion to the number of employees engaged and the hours they work rather than to the wages paid.

Owing to the difference in rates of wages paid to employees, the Labor Hours Method is applicable to a wider field than the Productive Labor Cost Method.

The rate to be used for applying the overhead to the product is determined as follows:

Total amount of factory overhead expense divided by total number of productive labor hours equals the rate per hour to be applied to the number of hours of work upon the product.

Machine Rate Method. Wherever the machinery is of more importance than the human element, and the workman is merely a tender or the tool of the machine, the machine rate plan is the most equitable method of distributing overhead expenses. On the other hand, if the machine is the secondary element either of the other described methods will probably prove more accurate.

In ascertaining the machine rate, the direct labor cost is obtained and also the number of operating hours. The material cost may also be combined with the direct labor and overhead cost before the machine rate is fixed if the materials operated on are the same in grade or price. If grade or price varies, the material cost should not be included.

Expenses which are more or less fixed in character such as rent, insurance, taxes, etc., accumulate and are chargeable to a machine whether it is operated or not. These charges are usually applied upon the basis of floor space or valuation of the equipment. All charges so far as possible should be charged direct to the various machines, the balance of the indirect expenses which cannot be directly connected with machine operation should then be classified as follows:

a. Expenses that can be identified with certain departments.

b. General operating expenses for the plant as a whole.

Each department adds to its own departmental indirect expenses its share of the general operating expense and proceeds to distribute the total over its own product in accordance with the plan of expense distribution which seems best to fit the needs of the case.

For example, if the departmental costs are based on a unit of measure, the total indirect expense of the department is divided by the total units of output giving the rate per unit. The rate so obtained is used to charge the machine or processes with their proportion of overhead by multiplying the number of units of product operated on in either case by the rate per unit.

If the costs are based on time, the departmental expense is divided by the total number of machine operating hours. This rate is added to the direct rate already established, giving the

complete or final rate per hour to be charged to the product of that department.

After all indirect and general operating expenses have been applied to a machine, the formula for ascertaining the machine rate is as follows:

Total amount of productive labor plus total amount of overhead applicable to a machine, divided by the total of machine operating hours, equals the machine rate to be applied to product for each hour of machine operation.

Assuming that an article passes through several machine processes, its overhead cost is arrived at by multiplying the hours of each process and adding together the separate totals thus obtained. Material cost must then be added to the process cost to give the final cost.

The machine rate method can only be used when all operations are performed by machine. It cannot be applied to general bench work and miscellaneous forms of hand labor.

There are many other methods of distribution, but for the average manufacturing plant one of the four described above will apply satisfactorily and give accurate results.

Conditions in some plants may be so varied that it will be necessary to use from one to four of the above methods in order to obtain a fairly accurate distribution of overhead to the cost of articles manufactured.

There has been much discussion concerning the many mooted points both in the theory and in the practical procedures of cost accounting. It has been my purpose to treat only of the well-established and generally accepted principles and technique leaving to another a presentation of these mooted matters. Before closing, it should be stated that in all accounting work, regardless of fine points of theory involved in a given situation, practical considerations must always govern if a full measure of satisfaction is to be secured.